Shawn McClintic

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Together

CLAIMS:

1. A holographic storage medium comprising:

a polymeric binder;

a photoactive monomer;

a photo-initiator; and

a stable, organic or organometallic dye;

wherein the dye is present in an amount sufficient to enhance the refractive index difference between a region of polymeric binder and a region of photopolymer.

2. The holographic storage medium of claim 1, wherein the dye is present in an amount of 0.1 percent by weight to 75 percent by weight of the total weight of the storage medium.

3. The holographic storage medium of claim 1, wherein at least a portion of the photoactive monomer is polymerized to provide an optically readable datum comprised within the holographic storage medium.

4. The holographic storage medium of claim 1, wherein the dye is covalently attached to the polymeric binder, the photoactive monomer, or both.

5. The holographic storage medium of claim 1, wherein the dye has an absorption maximum either greater than or less than a wavelength of light employed to initiate photopolymerization of the photoactive monomer.

6. The holographic storage medium of claim 1, wherein the polymeric binder is a polymethyl methacrylate, a copolymer of methyl methacrylate with an acrylic alkyl ester, a polysiloxane, a polysiloxane copolymer, a chlorinated polyethylene, a copolymer of vinyl chloride with acrylonitrile, a polyvinyl acetate, a polyvinyl alcohol, a polyvinyl formal, a polyvinyl butyral, a polyvinyl pyrrolidone, an ethyl cellulose, an acetyl cellulose, or a combination comprising one or more of the foregoing polymeric binders.

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7. The holographic storage medium of claim 1, wherein the photoactive monomer is a monomer comprising a cyclohexene oxide grouping linked to an Si--O--Si grouping, a vinyl ether, an alkenyl ether, an allene ether, a ketene acetal, an epoxy, an acrylate, a methacrylate, a methyl methacrylate, an acrylamide, a methacrylamide, a styrene, a substituted styrene, a vinyl naphthalene, a substituted vinyl naphthalene, a vinyl derivative, or a combination comprising one or more of the foregoing photoactive monomers.

8. The holographic storage medium of claim 1, wherein the photo-initiator is p-octyloxyphenyl phenyliodonium hexafluoroantimonate, ditolyliodonium tetrakis(pentafluorophenyl) borate, diphenyliodonium tetrakis(pentafluorophenyl)borate, tetrakis(pentafluorophenyl)borate, cumyltolyliodonium tetrakis(pentafluorophenyl)borate, η 6 -2,4-cyclopentadien-1-yl) (η 6 - isopropylbenzene)-iron(II) hexafluorophosphate, or a combination comprising one or more of the foregoing photoinitiators.

9. The holographic storage medium of claim 1, wherein the photo-initiator is bis(η-5-2,4- cyclopentadien-1-yl)bis[2,6-difluoro-3-(1H-pyrrol-1-yl)phenyl]titanium, 5,7,diiodo-3-butoxy-6- fluorone, or a combination comprising one or more of the foregoing photoinitiators.

10. The holographic storage medium of claim 1, further comprising a sensitizer for the photo-initiator.

11. A method for producing a holographic storage medium comprising:

forming a substrate comprising a polymeric binder, a photoactive monomer, a photo-initiator, and a stable organic or organometallic dye; and

writing data into the substrate with an information-carrying light pattern, at a wavelength suitable to activate the photo-initiator and to polymerize at least a portion of the photoactive monomer to form the holographic storage medium;

wherein the dye is present in an amount sufficient to enhance the refractive index difference between a region of polymeric binder and a region of photopolymer.

12. The method of claim 11, wherein the dye is covalently attached to the polymeric binder, the photoactive monomer, or both.

13. The method of claim 11, wherein the dye has an absorption maximum greater than or less than the wavelength of light suitable to activate the photo-initiator and to polymerize at least a portion of the photoactive monomer.

14. The method of claim 11, wherein the wavelength of light which is employed to activate the photo-initiator is about 375 nm to about 830 nm.

15. The method of claim 11, further comprising:

covalently attaching a linker group to a reactive functional group on the dye to form a dye material comprising a covalently attached linker group; and

covalently attaching the dye material comprising a covalently attached linker group to the photoactive monomer, the polymeric binder, or both.

16. The method of claim 11, wherein the wavelength of light which is employed to activate the photo-initiator is different from a wavelength of a light beam utilized to read data from the holographic storage medium.

17. The method of claim 11, wherein the wavelength of light which is employed to activate the photo-initiator is the same as a wavelength of a light beam utilized to read data from the holographic storage medium.

18. A method for storing data in an optical storage medium comprising:

forming a storage medium comprising a polymeric binder, a photoactive monomer, a photo-initiator, and a stable, organic or organometallic dye; and

illuminating the storage medium with a signal beam possessing data and a reference beam simultaneously for storing a hologram of the data contained by the signal beam in the optical storage medium;

wherein at least a portion of the photoactive monomer undergoes polymerization upon exposure to the signal beam, thereby forming a hologram in the storage medium; and

wherein the dye is present in an amount sufficient to enhance the refractive index difference between a region of polymeric binder and a region of photopolymer.

19. The method of claim 18, wherein the dye is covalently attached to the polymeric binder, the photoactive monomer, or both.

20. The method of claim 18, further comprising exposing at least a portion of the storage medium having an area larger than the hologram to a wavelength of light sufficient to react an unreacted photo-initiator and to polymerize an unpolymerized photoactive monomer.

21. An optical reading method comprising:

forming a storage medium comprising a polymeric binder, a photoactive monomer, a photo-initiator, and a stable organic dye;

illuminating the storage medium with a signal beam possessing data and a reference beam simultaneously for storing a hologram of the data contained by the signal beam in the optical storage medium, wherein at least a portion of the photoactive monomer undergoes polymerization upon exposure to the signal beam thereby forming a hologram in the storage medium;

illuminating the holographic storage media with a read beam; and reading the data contained by diffracted light from the hologram;

wherein the dye is present in an amount sufficient to enhance the refractive index difference between a region of polymeric binder and a region of photopolymer.

22. The method of claim 21, wherein the signal beam has a wavelength of about 375 nm to about 830 nm.

23. The method of claim 21, wherein the read beam has a wavelength of about 375 nm to about 830 nm.

24. The method of claim 21, wherein the read beam and the signal beam have the same wavelength.

25. The method of claim 21, wherein the wavelength of the read beam is shifted by about 10 to about 500 nm from the wavelength of the signal beam.